Understanding Emergency Department Pressures in Capital Health – Preliminary Findings

Technical Report

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EXECUTIVE SUMMARY

Background

Increased service pressures in the emergency departments of hospitals are a major concern for hospitals in North America and have been identified as a concern for the Capital Health region in Alberta. Strategies to deal with these service pressures have been identified and implemented within Capital Health. However, these strategies have usually been developed to address immediate concerns. A joint University of Alberta - Capital Health research project is currently being undertaken to develop long-term, system-wide recommendations for reducing service pressures in the emergency departments in Capital Health to enable the region to provide better care for patients.

In this initial phase of the project, we have attempted to document the nature and causes of service pressures that emergency departments in Capital Health faced in 1997/98 and 1998/99 through a quantitative analysis of administrative data. Specifically, we looked at when peak periods of utilization occurred in Capital Health emergency departments and identified factors associated with these peak periods of utilization.

Results

Utilization of Emergency Departments

Between fiscal years 1997/98 and 1998/99, the reported annual number of visits to the emergency departments in Capital Health increased by +7.3%. Age-sex distributions, overall and within each facility, remained consistent over the two years. However, differences in age-sex distributions were observed between the six emergency departments in Capital Health. In 1997/98, there were summer (May, June) and winter (December) peaks while in 1998/99, there was only a summer peak (August). March had the fewest emergency department visits for both years. At all facilities, Sunday had the highest number of visits while Thursday had the lowest number of visits. During 1997/98 the highest number of visits was observed on Boxing Day. During 1998/99 the highest number of visits was observed on Heritage Day. For both years, most holidays had a higher number of visits as

compared to the average number of daily visits during non-holiday Saturdays and Sundays. Over the two years, the highest numbers of visits were for injuries and poisonings and for diseases of the respiratory system. Periods of high mean and median visit durations and high proportions of patients leaving without being seen did not coincide with periods of high numbers of patient visits.

Factors Associated With Peak Periods of Utilization

In 1997/98, the winter peak of patient visits in December was characterized an increase in visits for those less than 10 years of age and for a segment of the elderly and by visits for *Health Status Requiring Contact with Health Services* and *Diseases of the Respiratory System* compared with March. In 1998/99, the summer peak in August was characterized by an increase in visits for those between 5 and 70 years of age and for visits for *Injuries and Poisoning* and for *Diseases of the Skin and Subcutaneous Tissue* compared to March. Generally, Sundays (high) had a larger number of visits for children less than 10 years of age and for *Injuries and Poisoning* and *Diseases of the Respiratory System* compared with Thursday (low).

Conclusion

As expected, during the two years of the study, patient visits to emergency departments in Capital Health were characterized by peak periods and less busy periods. Peak periods for patient visits were Sundays and holidays. In addition a summer peak was observed in both years studied and a winter peak occurred in 1997/98. Patient age and disease characteristics were associated with peaks in the number of patient visits. However variations in the numbers of visits by month and day of the week were not large. Therefore focusing attention only on reducing service pressures at these peak times is not indicated.

INTRODUCTION

Utilization of hospital emergency departments has been a concern for hospitals in North America for several years. In a study of 239 hospitals in the U.S. (Andrulis et al, 1991), researchers found that the problem of increased utilization of emergency department services was observed nationwide, especially in metropolitan areas and smaller hospitals. The same researchers found that in 1991, the mean waiting time was 7.5 hours and the holding time (time from decision to discharge to admission to other wards) was 3.5 hours for an ICU bed and 2.9 hours for a floor bed.

Visits to emergency departments have been found to increase during certain periods of the day and certain times of the year. One study found that pediatric trauma admissions in the U.S. increased dramatically in October and over ¾ of injuries occurred between 3:00 and 11:00 p.m. (Spisso and Beal, 1993). Another U.S. study found that patient volumes decreased on days preceding a holiday, and increased on the actual holiday, and the day after the holiday, and that day of the week, month of year, and high temperature/snowfall had significant impacts on patient numbers. (Hollerman Jr. et al, 1994). A study of psychiatric emergencies in Toronto found that emergency visits peaked on Mondays and declined until Friday, visits peaked in August and bottomed out in May, and more of these visits occurred in the day than at night. (Eastwood et al, 1979). Seasonal variations due to the "cold and flu" season were found to create a greater need during the colder seasons. Finally, a study of the pediatric use of emergency departments found that 33% of visits were on weekends, and 50% occurred when regular physicians were not in their offices. (Weir et al, 1989)

Overcrowding in emergency departments is due, in part to "preload" factors. These are factors leading to increased numbers of emergency department visits. One "preload" factor is the use of hospital emergency departments by patients with non-emergent care needs (HSURC, 1997). Studies have shown that non-emergent use of emergency departments continue to exist in Canada, with 3% to 15% of visits being non-urgent in larger centres (Burnett and Grover, 1996, Afilalo et al, 1995) and 30% to 77% being non-urgent in smaller centres (Close and Skene, 1994, Hader, 1994, Bostock and Hader, 1995). Suggestions have also been made that some of this "inappropriate" use may be due to the problem of unavailability and inaccessibility of acute and primary care services (Cooke and Finneran, 1994). However the issue of "inappropriate" use of hospital emergency departments is controversial as activities to reduce inappropriate use may affect those with urgent

emergency needs (HSURC, 1997). Factors leading to overcrowding in emergency departments due to delays in discharging patients from the emergency departments to appropriate sites of care are "after-load" factors. The most important proximal cause is the delay in admitting patients from the emergency department as inpatients because of the shortage of beds (Fromm et al, 1993). However shortages of in-patient beds may themselves be due to their use by patients waiting transfer to other sources of care such as long term care facilities.

The consequences of overcrowding, delays in the delivery of patient services, and patients leaving without receiving services, may result in increased morbidity. In a California study, a follow-up of patients who left without being seen by a physician due to long waits in the emergency department had similar chief complaints and similar triage nursing assessments or acuity ratings compared to those who stayed. Almost half of those who left were judged to need immediate medical attention. Of the patients who left, 11% ended up being hospitalized within the next week and 3% required emergency surgery (Baker et al, 1991). Delays in admitting patients to inpatient beds may also lead to sub-optimal care of emergency cases, and the inappropriate use of emergency department resources.

The problem of emergency department overcrowding has been identified as a concern for Capital Health in Alberta. Capital Health is one of Canada's largest integrated health systems and is responsible for planning and delivering a broad range of health services to the 816,000 people residing in the cities of Edmonton and St. Albert, and the counties of Strathcona and Leduc (Figure 1). These services include health promotion, disease prevention, emergency hospital care, inpatient hospital care, day surgery, and continuing care (including community care and long-term care)

Figure 1: The Geographical Boundaries of Capital Health

Hospitals in CH:

Misericordia Community Hospital and Health Centre

Grey Nuns Community Hospital and Health Centre

Sturgeon Community Hospital and Health Centre

Leduc Community Hospital and Health Centre

Royal Alexandra Hospital

University of Alberta Hospital

The emergency departments at the six sites* in the region see in excess of 300,000 patients per year. Between 1996/97 and 1998/99, the total number of emergency department visits increased by 7%, the percentage of inpatient admissions in the region admitted from emergency departments increased from 31% to 35%, the average length of emergency department stay increased by 30 minutes, and the average overall emergency department length of stay for patients who were admitted to in-patient care increased from 7.9 hours to 11.4 hours. (Capital Health Region Program Councils Annual Utilization Report, 1999).

To combat overcrowding and long waiting periods in the emergency department, several strategies have been implemented in Capital Health. Strategies to deal with "preload" factors include the movement of intravenous therapy from the emergency department, a media campaign to educate patients on finding alternatives to non-urgent care, the implementation of direct admission policies for patient transfers, as opposed to the older system of receiving transfers via the emergency department, the use of automated voice-messaging systems to direct patients calling the emergency department towards more appropriate resources and services, and an immunization campaign to prevent and control influenza outbreaks. Strategies to deal with the "after-load" factors include the opening of new acute care beds. Other strategies to deal with the managing the overcrowding of the emergency department include the development of reports to measure the availability of beds twice a day in order to better identify when pressure situations look imminent, pre-diversion guidelines to free up emergency department space in order to prevent ambulance diversions, bed management teleconference system to bring together site directors and administrators during peak demand periods in order to coordinate efforts, and finally an ambulance diversion policy. (Salesse M, 1999) These strategies have usually been developed to address immediate concerns and their impact has not been fully evaluated.

A joint University of Alberta-Capital Health research project is currently being undertaken to develop long-term, system-wide recommendations for reducing service pressures in the emergency departments in Capital Health to enable the region to provide better care for patients. We aim to document the nature and causes of service pressures that emergency departments in Capital Health face and to identify potentially effective interventions for

* CH recently opened a seventh site, the Northeast CHC, in September 1999.

reducing these pressures. The study will involve quantitative analyses of administrative data, focus-group interviews with emergency department staff and managers, and systematic literature reviews. This report addresses exploratory analyses of administrative data aimed at identifying:

1. When peak periods of utilization occur in Capital Health emergency departments
2. Characteristics patients and disease conditions associated with peak periods of utilization in Capital Health emergency departments.

METHODS

Visits to emergency departments within Capital Health were measured using the Ambulatory Care Classification System (ACCS) database obtained from Alberta Health and Wellness. This database contains a record of each visit made to the emergency department of a Capital Health acute care facility. All visits to a Capital Health emergency department were counted, regardless of whether the patient resided within Capital Health boundaries. Since data for 1999/00 was not available at the time of data analysis, we limited the scope of our study to fiscal years 1997/98 and 1998/99.

From the ACCS data, which includes all ambulatory care visits (including day surgery and outpatient clinic visits) we selected emergency department visits based on a MIS code of 71310– a code that describes the functional center where the service took place. Variables of interest included the date of the visit, the patient's age and sex and the primary ICD-9-CM diagnosis. Visits were calculated overall for the year and by month, day of week and holiday period* for each facility separately as well as for all facilities combined. To enable comparisons between months, the visits by month were adjusted to months of 30 days. To do this, we divided the number of visits for a month by the number of days in the month to get a mean daily volume. The mean daily volume was then multiplied by 30 to calculate an adjusted monthly volume. No adjustments had to be made for leap years during this period of study. The mean and median visit durations and the proportion of patients leaving without being seen were also calculated for each month and day of week. The numbers of visits by holiday were compared with the average

* A list of the holidays included in these analyses can be found in Appendix 1

number of visits for non-holiday Saturdays and Sundays. This was done by taking the sum of the visits for all non-holiday Saturdays and Sundays and dividing these by the total number of non-holiday Saturdays and Sundays. For 1997/98 and 1998/99 respectively, 2,784 visits (1% of all visits) and18,739 visits (5% of all visits) were excluded from the analysis of visit duration due to the absence of information on admission and discharge time in the data.

To identify factors associated with peak periods of utilization, we analyzed the age and sex characteristics and the primary (most responsible) diagnosis of patients coming to the emergency departments during the highest periods of utilization as well as the lowest periods of utilization. These analyses were done for high/low months and high/low days of the week for each fiscal year. Diagnosis information was presented at two levels: the ICD-9-CM chapter level and sub groupings commonly used by Capital Health.

RESULTS

Utilization of Emergency Departments

Overall Utilization

Table 1 and Figure 2 show the patterns of utilization over the two-year period. The reported annual number of visits increased by 23,531 (+7.3%) overall, from 324,442 to 347,964. The largest percentage increases were for the Grey Nuns Community Health Centre (+12.0%) and the Misericordia Community Health Centre (+11.3%). Over the study period, the Royal Alexandra Hospital had the largest volume of visits and the Grey Nuns Community Health Centre had the second largest volume of visits.

Overall age-sex distributions of patients visiting the emergency department remained consistent over the two years, as did the age-sex distributions within each facility. However, differences were observed between the facilities. Figure 3 outlines the age-sex patterns of utilization for all emergency department facilities combined (averaged over the two year period). The results show that those aged 1-4 and 15-44 years had the highest number of visits for all facilities combined. A similar pattern of utilization was observed for all but one facility, though the magnitude of the peaks differed. The Grey Nuns Community Health Centre had a more

pronounced peak for those aged 1-4 years, while the University of Alberta (U of A) Hospital and the Royal Alexandra Hospital had more pronounced peaks for those aged 15-44 years. The exception to this pattern was the Sturgeon Community Health Centre, where the number of visits peaked at ages 1-4 and 15-19 years only (data not shown).

Emergency Department Visits by Month:

The analyses of emergency department visits by month (adjusted to 30 day months) showed a different pattern for each year of the study. In 1997/98, there were summer (May, June) and winter (December) peaks (Figure 4A), while in 1998/99 there was only a summer peak (August). (Figure 4B). March had the fewest emergency department visits for both years.

Tables 2A and 2B show the number of visits and the difference between the actual number of visits for the month and the mean number of visits per month for that fiscal year. Results are shown for each hospital separately as well as for all hospitals combined. In 1997/98, the December peak was observed in all facilities, with the U of A Hospital having the highest volume increase, compared with the mean monthly visits for the facility. The peak in May was observed in all but two hospitals, with the Leduc Community Health Centre having the highest volume increase. The peak in June was observed in all but one hospital, with the Grey Nuns Community Health Centre having the highest volume increase. In 1998/99, the May to August peaks were observed at all hospitals. For the month of August, which had the highest number of visits, large increases were noticed at the Misericordia Community Health Centre, and the Royal Alexandra and U of A hospitals.

Emergency Department Visits by Day of Week

The total number of visits for the year broken down by day of week showed a consistent pattern over the two years of the study (Figure 5). Sunday had the highest number of visits while Thursday, the lowest number of visits. Table 3 shows the average number of visits for the two years of the study by day of the week for each hospital separately, as well as for all hospitals combined. The peak in Sunday visits was observed for all hospitals, with the U of A Hospital having the highest increase in weekend (Saturday and Sunday) visits, when compared to the mean number of visits over all the days of the week for the facility.

Emergency Department Visits by Diagnosis

Table 4 shows the number of visits by ICD-9-CM diagnosis. Over the two years, visits were the highest for *Injuries and Poisonings*, *Diseases of the Respiratory System* (especially acute respiratory infections) and *Symptoms, Signs, and Ill-Defined Conditions* (especially unspecified abdominal and chest pain, headaches, painful respiration, renal colic and convulsions - results not shown). Over the two years, there was a large increase (+99.6%) for visits classified as visits for *Health Status Requiring Contact with Health Services*. The majority of these were for breathing exercises (+10,498 cases or +45% of increase for the ICD-9-CM chapter) and radiological exams not elsewhere classified (+5,807 cases or +24% of increase for the ICD-9-CM chapter).

Emergency Department Visits by Holiday

The analyses of emergency department visits by holiday showed different peaks for each year of the study. For 1997/98 (Figure 6A), the highest number of visits was observed on Boxing Day. For 1998/99 (Figure 6B), the highest number of visits was observed on Heritage Day. For both years, Victoria Day, Heritage Day, Labour Day, Boxing Day, New Years' Day and Family Day had a higher number of visits as compared to the average number of daily visits for a non-holiday weekend.

Tables 5A and 5B show the number of visits for each year by holiday for each hospital separately, as well as for all hospitals combined. For 1997/98, the peak on Boxing Day was observed at all facilities, with the Grey Nuns and Sturgeon Community Health Centres and the U of A Hospital having the highest increase in visits, when compared to the average daily visit for a non-holiday weekend. The distribution of visits for the other peak periods shows no consistent pattern. The U of A Hospital and the Leduc Community Health Centres had the highest increase in visits on Victoria Day, the Leduc Community Health Centre and Sturgeon Community Health Centre had the highest increase on Heritage Day, the Royal Alexandra Hospital had the highest increase on Labour Day, the Grey Nuns Community Health Centre and Sturgeon Community Health Centre had the highest increase on Christmas Day and Family Day, and the Grey Nuns Community Health Centre had the highest increase on New Years Day. For 1998/99, the peak on Heritage Day was observed at all facilities, with the U of A and Royal Alexandra hospitals having the highest increase in visits. Again, no consistent patterns were seen for the other peak periods. The

Grey Nuns Community Health Centre had the highest increase in visits for Victoria Day and Boxing Day, the Grey Nuns Community Health Centre and Royal Alexandra Hospital had the highest increase for Canada Day, the Royal Alexandra Hospital had the highest increase on Labour Day, and the Misericordia Community Health Centre and Sturgeon Community Health Centre had the highest increase in visits for Family Day.

Figure 7 shows deviations from the annual mean, for each month in 1998/99, for the number of monthly visits, and three measures of wait times (mean visit duration, median visit duration and proportion of patients leaving without being seen). The measures of wait times show similar trends that are the inverse of those for the number of monthly visits. Figure 8 shows similar data by day of week. An interesting finding is the variation in the proportion of patients leaving without being seen with a Monday peak and a Thursday trough. The variation in the number of visits by month and by day of week is less than that for wait times.

Factors Associated with Peak Periods of Utilization

Age and Sex

Figure 9A and 9B show the changes in visits by age and sex between months with high and low utilization for 1997/98 and 1998/99 respectively. In 1997/98, the peak in December was characterized by a larger number of visits for those less than 10 years of age and for a segment of the elderly. Specifically, females 5-9 years of age (50% increase), males and females 1-4 years of age (range 35% to 38% increase), and males 85 years of age and higher (37% increase) had the largest percentage increases between March (low) and December (high). In 1998/99, the August peak was characterized by a larger number of visits for those between 5 and 70 years of age. Between the ages of 15 and 54, males had a higher increase than females. The age-sex groups with the highest increase overall were females 65-69 (53% increase) and males 5-9 (40% increase) between March (low) and August (high).

Figure 10 shows the changes in visits by age and sex between days of the week with high (Sunday) and low (Thursday) utilization for both years combined. Generally, Sundays (high) had a larger number of visits by the younger age groups, with those less than one year of age having the highest increase in visits. This difference gradually decreased with increasing age.

Primary Diagnosis and Month

Tables 6 and 7 show the distribution of the primary diagnosis for months with high and low utilization for 1997/98 and 1998/99 respectively. Numbers of visits are presented by ICD-9-CM chapter as well as selected groupings of ICD-9-CM diagnosis codes. While all ICD-9-CM chapters are presented, to enhance the presentation of results, only those groupings with a high number of cases are shown.

In 1997/98, the months with the highest and lowest number of visits to the emergency department were December and March, respectively. The difference in the number of visits between the two months was 3,421 or 13.5%. In December, there was a large increase in the number of visits classified as visits for *Health Status Requiring Contact with Health Services* (especially visits for cardiac screening, breathing exercises and unspecified consultations – results not shown) as well as for *Diseases of the Respiratory System* (especially acute respiratory infections) when compared to March. There was also an increase in December for visits for unspecified diseases of the digestive system and open wounds of the upper limb.

In 1998/99, the months with the highest and lowest number of visits to the emergency department were August and March, respectively. The difference in the number of visits between the two months was 4,275 or 15.7%. In August, there was a large difference in the number of visits for *Injuries and Poisoning* (especially visits for poisonings, wounds of the upper and lower limb, and superficial injuries) and for *Diseases of the Skin and Subcutaneous Tissue* (especially cellulitis – results not shown) when compared to March. There was also an increase in August in visits for diseases of the urinary system, *Diseases of the Musculoskeletal System* and *Diseases of the Nervous System and Sense Organs.*

Primary Diagnosis and Day of Week

Table 8 shows the distribution of the primary diagnosis by day of week for 1997/98 and 1998/99 combined. Over the two years, there was a 12,257 (13.5%) difference in visits between the days of the week with the highest number of visits (Sunday) and the lowest number of visits (Thursday). Sundays usually had a higher number of visits for *Injuries and Poisoning* (especially sprains/strains of joints and adjacent muscles, and open wounds of the head) and *Diseases of the Respiratory System* (especially acute

respiratory infections). While Thursdays had a lower number of overall visits, this day had a higher number of visits for visits classified as *Health Status Requiring Contact with Health Services* (especially orthopedic aftercare, surgical dressing changes and suturing, and chemotherapy encounters – results not shown) and *Diseases of the Circulatory System*.

DISCUSSION

Utilization of Emergency Departments

The number of emergency department visits increased in all facilities between 1997/98 and 1998/99. The overall reported 7% increase in visits is accounted for by an increase in the number of visits for *Health Status Requiring Contact with Health Services*. The seasonal patterns varied over the two study years. There were early summer and winter peaks in 1997/98 but only a late summer peak in 1998/99. In both years March had the fewest visits. In contrast, in both years the mean number of visits was highest for Sundays and lowest for Thursdays. However the variations in the numbers of visits by month and day of the week were not large (< 10% increase or decrease from mean) while variations for measures of waiting times were much larger. The variations in the measures of wait times may be due to variations in both the severity of illnesses and staffing levels at different times and require further investigation.

Factors Associated with Peak Periods of Utilization

The excess in December visits over March visits in 1997/98 is greatest in the young (0-9 years) and in the older (55+ years) age groups. Disease categories with the greatest increases were *Diseases of the Respiratory System* and *Health Status Requiring Contact with Health Services*. In contrast the very young (0-4 years) and the elderly (70+ years) contributed little to the excess in August visits over March visits in 1998/99 most of which is accounted for by *Injuries and Poisoning* and *Diseases of the Skin and Subcutaneous Tissue*. The excess in Sunday over Thursday visits is highest in the young (0-9 years) and for *Injuries and Poisoning* and *Diseases of the Respiratory System*. This may be related to lack of access to family practitioners over weekends.

Strengths and Limitations of Study

The analyses presented in this report are based on ACCS data obtained from Alberta Health and Wellness. This database captures data on all emergency department visits in Alberta and is therefore potentially very useful for describing temporal patterns of emergency department utilization.

For this study, we only analyzed data for the most recent two years for which ACCS data were available, the last year being 1998/99. Since the analyses used pre-existing administrative databases, which were gathered for other purposes, the investigators have no control over the accuracy of the data collected. Emergency department visits may have been over-counted as we identified these visits from the ACCS data using the MIS Chart of Accounts code of 71310. This identifies visits taking place in emergency departments. Scheduled outpatients visits occurring in emergency departments and multiple visits for a single patient encounter, as described may also be included. In addition, analyses were limited by the absence of certain variables in the data set. (e.g. data elements that could have provided useful information for assessing after load pressures but were not consistently available include acuity level, nursing workload hours, and time of decision to discharge). Some of these data limitations can be avoided by analyzing additional data collected by Capital Health.

From our consultations with Capital Health staff, we learned that if, during an emergency department visit, a patient received services from an allied health professional (e.g. respiratory technician) after seeing a physician or nurse, the visit to the allied health professional might be recorded as a separate visit. We speculate that these may account for many visits with missing admission and discharge times (though not necessarily all of them). We also speculate that some of the reported increase in the number of visits in 1998/99 may be due to more visits to allied health professionals being recorded as separate visits than in 1997/98. Some of the observed temporal differences in patterns of disease over time may also be due to changes in coding practices for allocating the primary diagnosis.

CONCLUSION

As expected, the utilization of emergency departments in Capital Health is characterized by peak periods and busy periods. Peak periods were identified as Sundays, and to some extent summer months and winter months. Patient age and disease characteristics were seen to contribute to these peaks. However the lack of large variations in the numbers of visits by month and day of the week suggests that focusing attention on peak times is not indicated.

The next phase of the project will involve the use of focus groups with emergency department staff and managers to identify provider perceptions of what service pressures exist, when and why service pressures occur, and what could be done to reduce these pressures. The information from this phase of the project and the subsequent data analyses will be used to complement the findings from the focus groups. In addition we plan to do a systematic review of peer reviewed articles and the grey literature assessing interventions used to reduce emergency department service pressures in other jurisdictions. The results of these analyses will provide a better understanding of service pressures in Capital Health emergency departments and, combined with further qualitative analyses, will help in developing recommended strategies for reducing these service pressures.

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Table 1: Annual Visits by Facility

Facility	Number of Visits 97/98	98/99	% Change	Mean
Misericordia	46,197	51,413	11.3%	48,805
Grey Nuns	63,590	71,227	12.0%	67,409
RAH	87,110	91,605	5.2%	89,358
UAH	60,773	62,145	2.3%	61,459
Leduc	19,999	20,776	3.9%	20,388
Sturgeon	46,764	50,798	8.6%	48,781
All	324,433	347,964	7.3%	336,199

Figure 2: Annual Visits by Facility

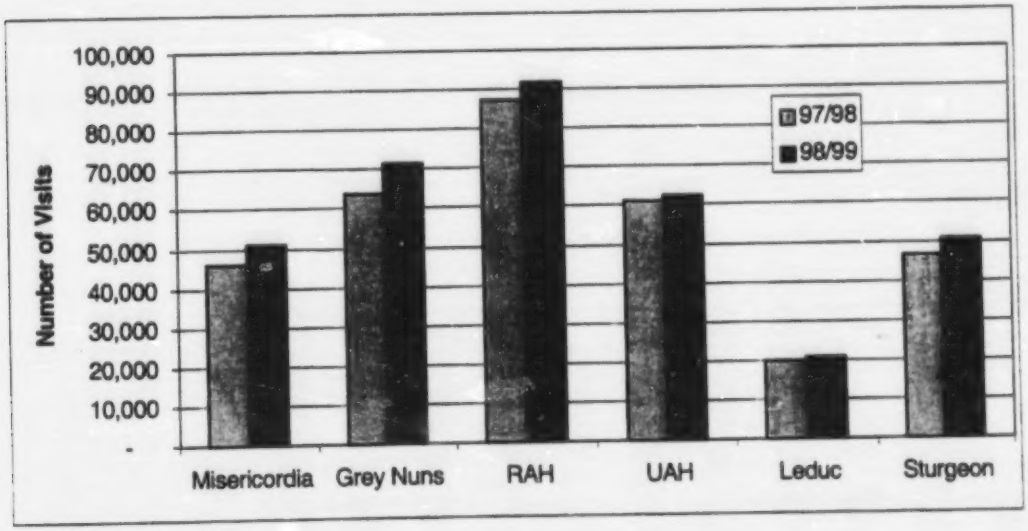

Figure 3: Average Annual Visits by Age and Sex

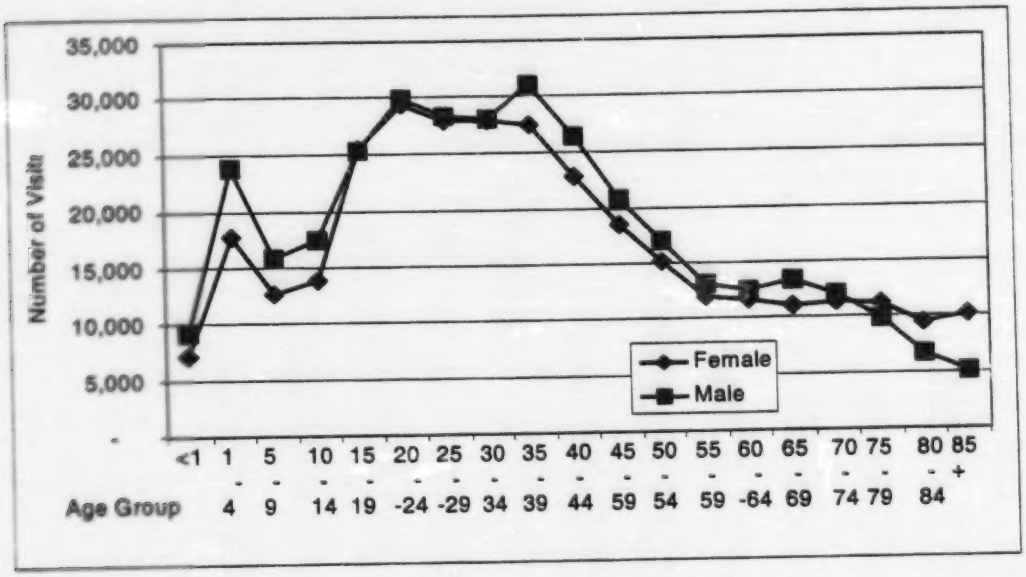

Figure 4A: Emergency Department Visits by Month (1997/98)

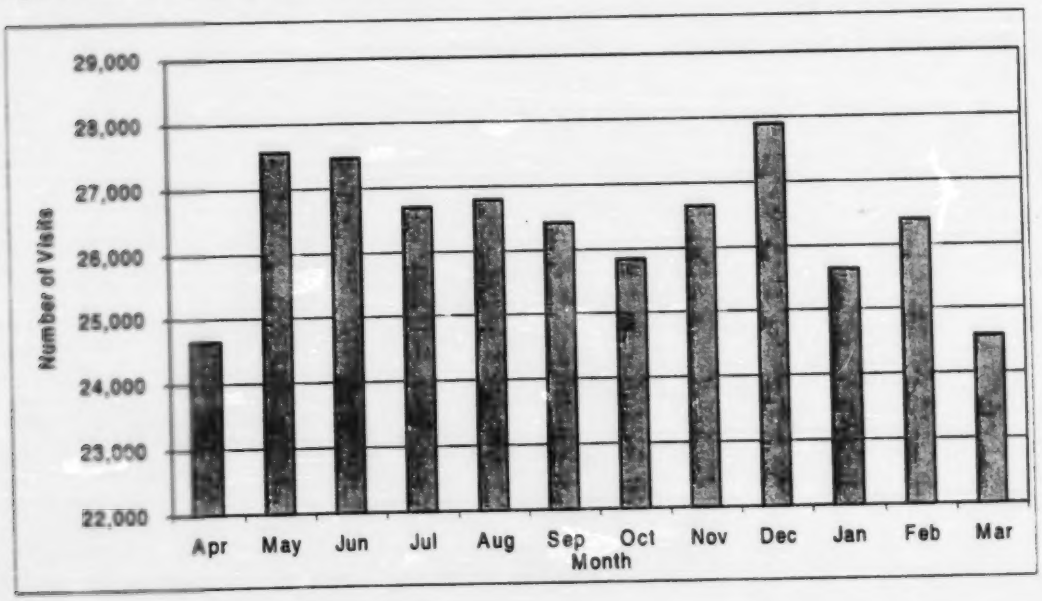

Figure 4B: Emergency Department Visits by Day of the Week (1998/99)

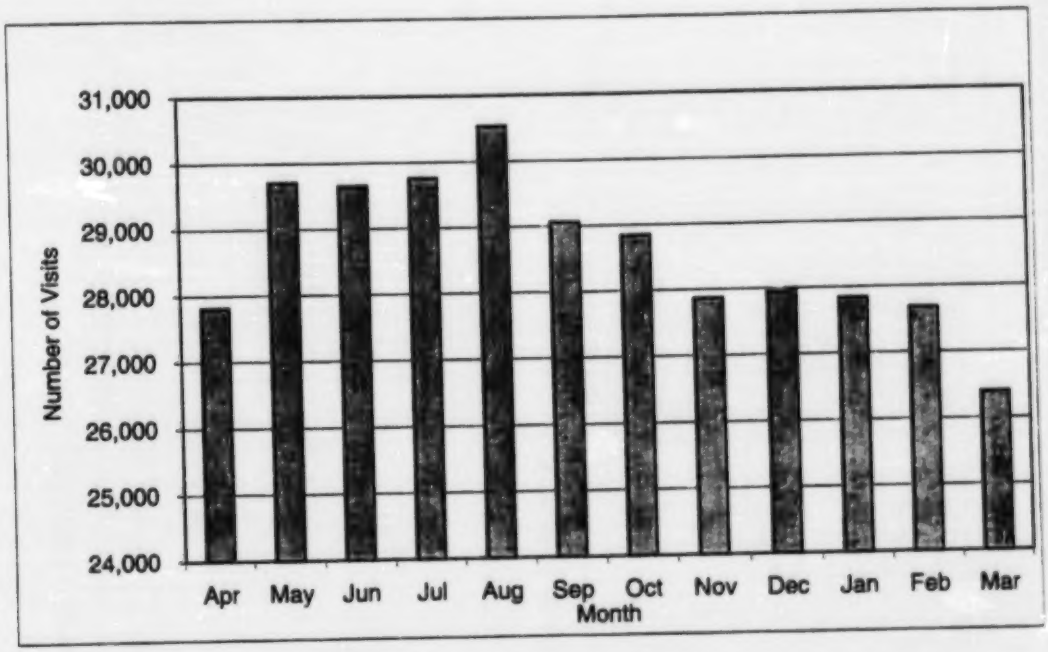

Table 2A: Emergency Department Visits by Month (1997/98)

	Visits (1,000s)							Difference from Mean for Facility (%)						
	MCHC	GNCHC	RAH	UAH	LCHC	SCHC	All	MCHC	GNCHC	RAH	UAH	LCHC	SCHC	All
Apr	3.6	4.6	6.7	4.6	1.5	3.6	24.6	-4.41	-10.08	-1.07	-9.09	-15.36	-6.37	-6.57
May	3.7	5.0	7.0	5.1	2.8	4.0	27.6	-1.59	-3.05	1.91	0.65	61.55	4.45	4.51
Jun	3.8	5.4	7.0	5.3	1.7	4.3	27.5	1.53	5.33	2.11	4.01	-4.54	13.07	4.16
Jul	3.8	5.4	6.9	5.1	1.6	3.9	26.7	-0.28	4.22	1.60	0.65	-5.96	1.55	1.15
Aug	4.1	5.2	6.9	5.2	1.6	3.8	26.8	7.63	1.43	0.83	3.48	-8.12	-1.39	1.51
Sep	3.8	5.3	6.8	5.3	1.6	3.6	26.4	-0.20	3.38	0.01	4.76	-8.09	-5.98	0.15
Oct	3.6	5.1	6.9	4.9	1.7	3.7	25.8	-4.37	-1.08	0.62	-4.03	-3.02	-2.59	-2.02
Nov	3.9	5.3	7.0	5.0	1.6	3.8	26.6	3.97	2.29	2.98	-0.70	-7.69	-1.38	0.94
Dec	4.0	5.5	6.9	5.8	1.8	3.9	27.9	5.03	5.96	1.44	14.47	2.63	3.48	5.71
Jan	3.6	5.0	6.6	5.1	1.6	3.7	25.7	-3.98	-4.02	-3.77	1.51	-7.12	-1.80	-2.77
Feb	3.8	5.3	6.7	4.8	1.8	4.0	26.4	1.93	1.81	-2.30	-4.65	3.01	4.87	0.05
Mar	3.6	4.9	6.5	4.5	1.6	3.5	24.6	-5.26	-6.17	-4.36	-11.05	-7.29	-7.92	-6.84
Mean	3.8	5.2	6.8	5.1	1.7	3.8	26.4							

Table 2B: Emergency Department Visits by Month (1998/99

	Visits (1,000s)							Difference from Mean for Facility (%)						
	MCHC	GNCHC	RAH	UAH	LCHC	SCHC	All	MCHC	GNCHC	RAH	UAH	LCHC	SCHC	All
Apr	4.1	5.8	7.2	5.1	1.7	3.9	27.8	-4.05	-0.80	-4.91	0.78	1.63	-6.24	-2.73
May	4.3	6.2	7.5	5.4	1.9	4.4	29.7	2.11	5.95	0.09	6.42	8.55	4.83	3.92
Jun	4.4	6.3	7.6	5.3	1.8	4.2	29.6	4.57	6.83	1.36	3.76	5.62	1.76	3.70
Jul	4.6	6.1	7.6	5.4	1.8	4.3	29.8	9.19	4.31	0.77	5.46	5.10	2.40	4.07
Aug	4.6	6.1	7.9	5.5	1.9	4.5	30.5	9.33	4.07	5.40	8.62	10.08	6.99	6.79
Sep	4.3	6.0	7.5	5.3	1.7	4.2	29.1	0.92	2.85	-0.05	4.21	2.10	0.40	1.64
Oct	4.2	5.9	8.0	4.9	1.6	4.2	28.8	-0.18	0.64	5.93	-3.28	-6.57	1.43	0.90
Nov	4.2	5.6	7.7	4.8	1.5	4.1	27.9	-1.54	-5.09	2.70	-6.05	-11.66	-1.35	-2.53
Dec	4.3	5.9	7.2	4.9	1.6	4.2	28.0	1.49	0.23	-4.73	-4.13	-9.12	0.13	-2.24
Jan	3.9	5.7	7.4	4.9	1.7	4.2	27.8	-6.53	-2.12	-2.33	-3.85	1.36	-0.17	-2.64
Feb	3.9	5.7	7.4	4.8	1.8	4.0	27.7	-7.68	-2.06	-1.71	-5.34	4.06	-3.32	-3.20
Mar	3.9	5.0	7.3	4.8	1.5	3.9	26.4	-7.65	-14.83	-2.52	-6.60	-11.16	-6.85	-7.67
Mean	4.2	5.9	7.5	5.1	1.7	4.2	28.6							

Figure 5: Emergency Department Visits by Day of Week (Average for 1997/98 and 1998/99)

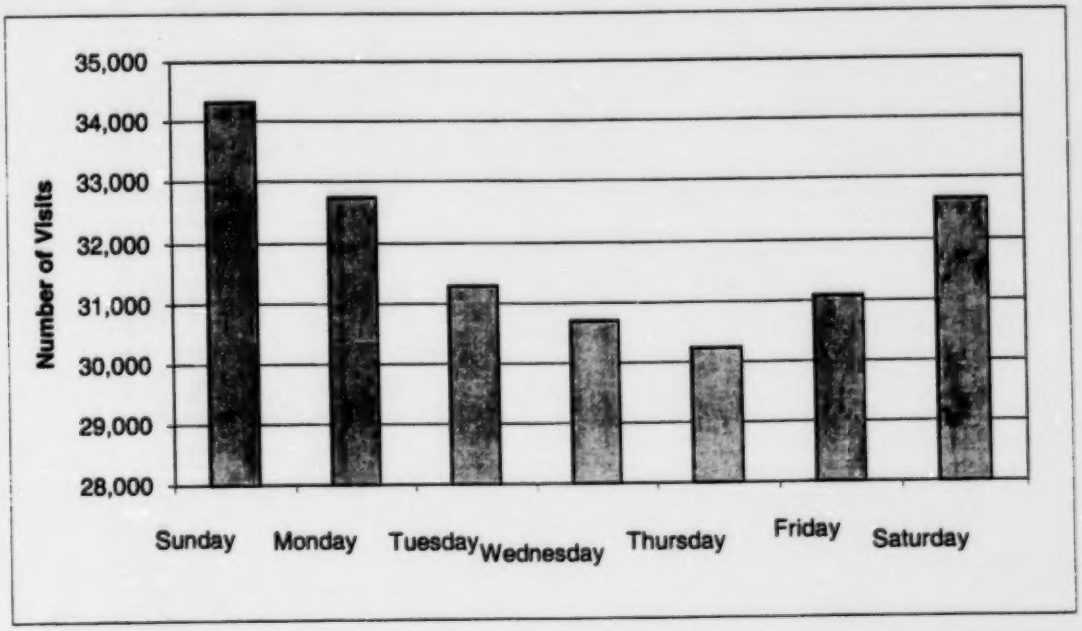

Table 3: Emergency Department Visits by Day of Week

	Mean Number of Visits (1,000s)							Difference from Mean for Facility (%)						
	MCHC	GNCHC	RAH	UAH	LCHC	SCHC	All	MCHC	GNCHC	RAH	UAH	LCHC	SCHC	All
Sunday	5.8	6.1	7.7	7.4	3.8	3.6	34.3	7.26	9.86	4.87	6.37	9.91	11.80	7.71
Monday	5.5	5.7	7.5	7.1	3.6	3.3	32.7	2.71	2.58	2.06	2.06	4.43	4.38	2.75
Tuesday	5.3	5.4	7.3	6.7	3.3	3.2	31.3	-2.08	-2.44	-0.60	-2.54	-2.48	-0.28	-1.76
Wednesday	5.2	5.3	7.2	6.7	3.3	3.0	30.7	-4.03	-4.50	-1.75	-3.61	-3.68	-5.58	-3.61
Thursday	5.1	5.3	7.1	6.6	3.2	2.9	30.2	-4.91	-5.59	-3.55	-4.00	-7.78	-7.79	-5.11
Friday	5.2	5.4	7.3	6.8	3.3	3.0	31.1	-2.52	-2.89	-1.34	-1.59	-3.07	-5.29	-2.45
Saturday	5.6	5.7	7.4	7.1	3.5	3.3	32.6	3.56	2.97	0.30	3.30	2.68	2.76	2.47
Mean	5.4	5.6	7.4	6.9	3.4	3.2	31.9							

Table 4: Emergency Department Visits by Primary Diagnosis

	97/98	98/99
Injuries and Poisoning	**90,990**	**91,806**
Burns	1,744	1,606
Complications Of Surgical & Medical Care	3,640	3,572
Concussion	1,017	1,261
Contusion With Intact Skin Surface	13,980	13,673
Effects Of Foreign Body Entering Through Orifice	3,481	3,185
Fracture Of Ankle	1,520	1,702
Fracture Of Femur	1,269	1,351
Fracture Of Foot	1,645	1,581
Fracture Of Hand	3,117	3,191
Fracture Of Radius Ulna	2,742	3,015
Fracture Of Skull	1,283	1,266
Open Wound Of Head	7,209	7,267
Open Wound Of Lower Limb	2,208	2,304
Open Wound Of Upper Limb	9,409	8,927
Other & Unspecified Effects Of External Causes	1,303	1,042
Poisonings By Drugs	3,081	3,009
Sprains & Strains Of Joints & Adjacent Muscles	16,151	16,537
Superficial Injuries	4,126	3,956
Traumatic Complications And Unspecified Injuries	2,078	2,693
Symptoms, Signs, and Ill-Defined Conditions	**37,220**	**38,792**
Diseases of the Respiratory System	**32,718**	**31,691**
Acute Bronchitis, Bronchiolitis	1,836	2,541
Acute Respiratory Infections	11,676	10,770
Asthma	6,684	6,690
Bronchitis, Not Specified As Acute Or Chronic	1,079	1,207
COPD	1,205	1,019
Influenza	1,531	1,296
Other Diseases Of The Respiratory System	1,405	1,563
Other Diseases Of Upper Respiratory System	1,707	1,837
Pneumonia	4,718	3,784
Diseases of the Digestive System	**25,067**	**24,972**
Diseases Of Oral Cavity, Salivary Glands & Jaws	4,124	3,715
Other Diseases Of The Digestive System	20,943	21,257
Health Status Requiring Contact With Health Services	**23,302**	**46,512**
Diseases of the Skin and Subcutaneous Tissue	**22,702**	**20,932**

Figure 6A: Emergency Department Visits by Holiday (97/98)

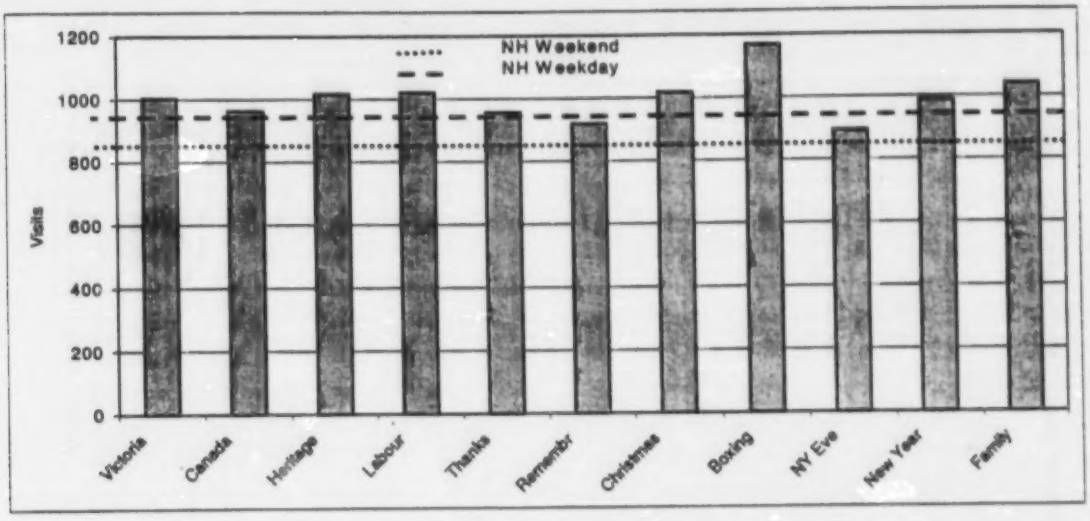

Figure 6B: Emergency Department Visits by Holiday (98/99)

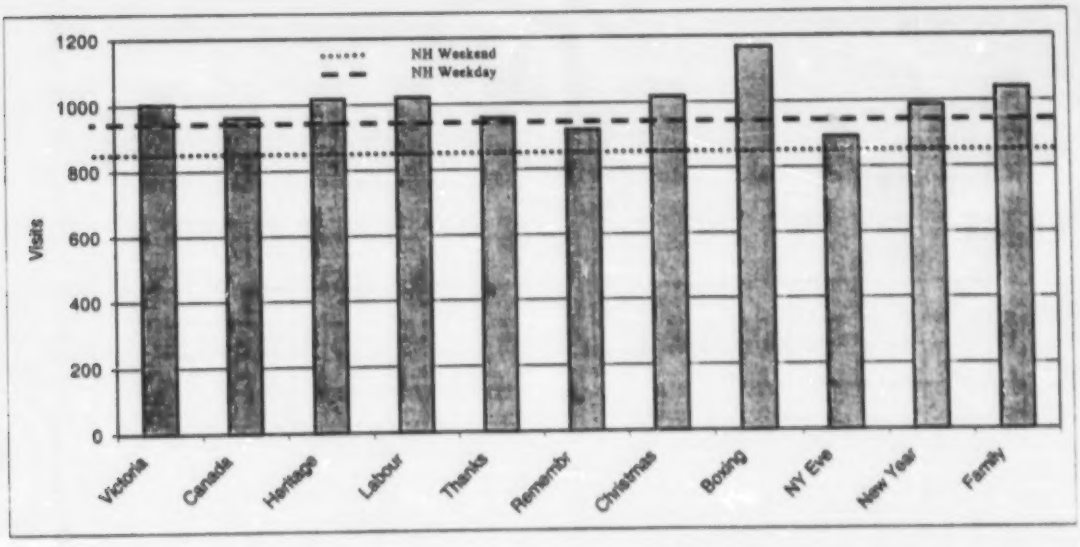

Table 5A: Emergency Department Visits by Holiday (97/98)

	Visits							Difference from Average Weekend (%)						
	MCHC	GNCHC	RAH	UAH	LCHC	SCHC	All	MCHC	GNCHC	RAH	UAH	LCHC	SCHC	All
Victoria	133	190	244	206	87	144	1,004	-4.18	3.45	0.43	16.28	48.26	3.11	6.70
Canada	155	194	254	168	57	135	963	11.67	5.63	4.54	-5.17	-2.86	-3.34	2.35
Heritage	146	190	252	185	77	168	1,018	5.18	3.45	3.72	4.43	31.22	20.29	8.19
Labour	143	196	284	191	62	146	1,022	3.02	6.72	16.89	7.82	5.66	4.54	8.62
Thanks	139	196	246	165	57	154	957	0.14	6.72	1.25	-6.86	-2.86	10.27	1.71
Remembr	135	175	224	188	49	148	919	-2.74	-4.72	-7.80	6.12	-16.50	5.97	-2.33
Christmas	134	217	250	194	46	177	1,018	-3.46	18.15	2.90	9.51	-21.61	26.74	8.19
Boxing	172	234	278	228	73	183	1,168	23.92	27.41	14.42	28.70	24.40	31.03	24.13
NY Eve	122	176	232	175	66	122	893	-12.11	-4.17	-4.51	-1.22	12.47	-12.64	-5.09
New Year	136	212	250	186	56	148	988	-2.02	15.43	2.90	4.99	-4.57	5.97	5.00
Family	158	206	264	173	69	171	1,041	13.83	12.16	8.66	-2.35	17.59	22.44	10.64

Table 5B: Emergency Department Visits by Holiday (98/99)

	Visits							Difference from Average Weekend (%)						
	MCHC	GNCHC	RAH	UAH	LCHC	SCHC	All	MCHC	GNCHC	RAH	UAH	LCHC	SCHC	All
Victoria	162	248	265	203	69	160	1,107	18.62	29.74	5.92	21.09	22.32	20.15	18.38
Canada	152	224	276	178	60	157	1,047	11.30	17.19	10.32	6.18	6.36	17.89	11.96
Heritage	161	237	304	229	70	178	1,179	17.89	23.99	21.51	36.60	24.09	33.66	26.08
Labour	171	212	300	196	58	157	1,094	25.21	10.91	19.91	16.92	2.82	17.89	16.99
Thanks	127	207	257	172	62	153	978	-7.01	8.29	2.72	2.60	9.91	14.89	4.58
Remembr	116	173	267	166	52	149	923	-15.06	-9.49	6.72	-0.98	-7.82	11.89	-1.30
Christmas	166	223	217	155	46	151	958	21.55	16.66	-13.26	-7.54	-18.45	13.39	2.45
Boxing	151	254	261	204	62	154	1,086	10.56	32.88	4.32	21.69	9.91	15.64	16.13
NY Eve	148	172	210	163	35	125	853	8.37	-10.02	-16.06	-2.77	-37.95	-6.14	-8.78
New Year	194	202	241	168	63	189	1,057	42.05	5.68	-3.67	0.22	11.68	41.92	13.03
Family	153	209	226	190	64	164	1,006	12.03	9.34	-9.67	13.34	13.45	23.15	7.58

Figure 7: Changes in Indices of Service Pressure for Emergency Department Visits by Month, 1998/99

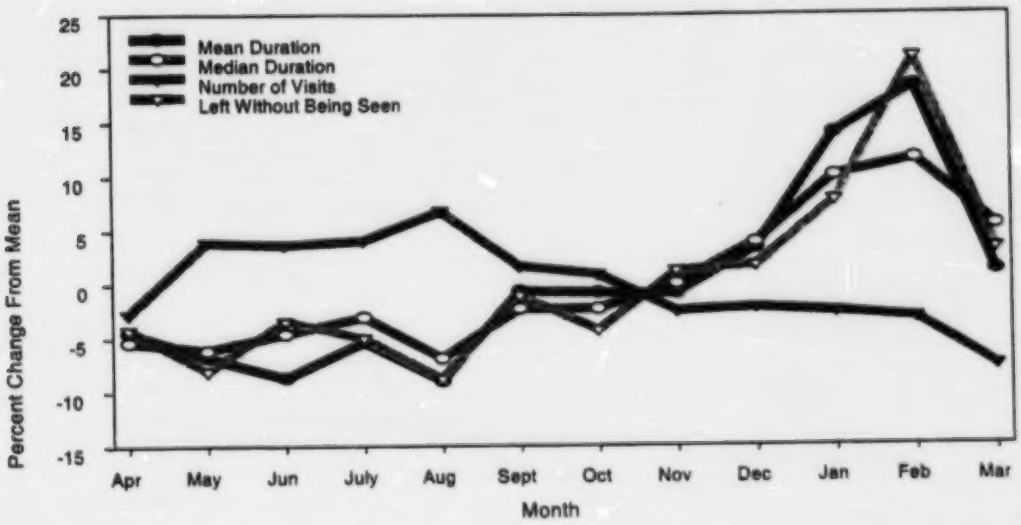

Figure 8: Change in Indices of Service Pressure for Emergency Department Visits by Day of Week, 1998/99

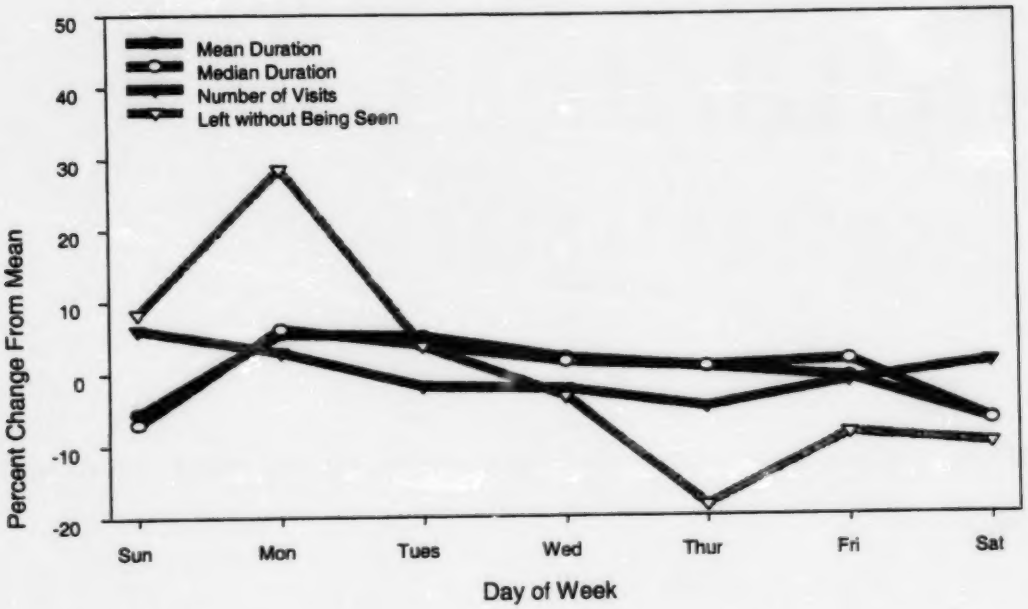

Figure 9A: Emergency Department Visits by Age-Sex and Month (97/98)

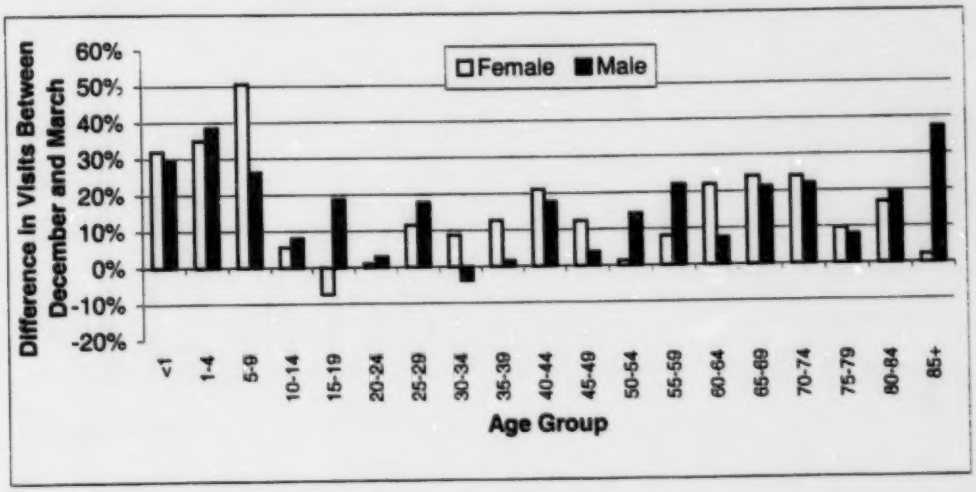

Figure 9B: Emergency Department Visits by Age, Sex and Month (98/99)

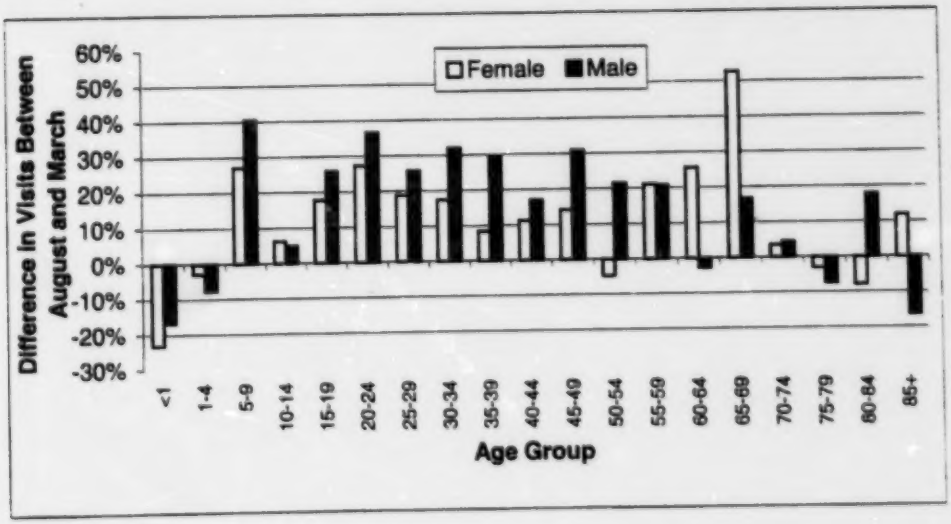

Figure 10: Emergency Department Visits by Age-Sex and Day of Week

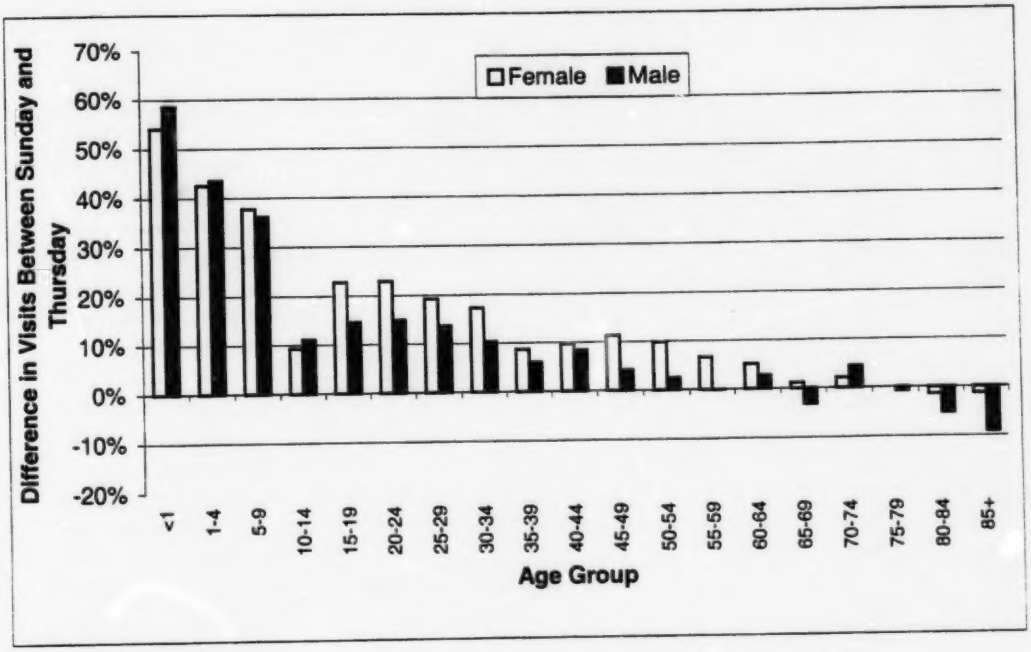

Table 6: Primary Diagnosis by Month (97/98)

	March 98 (Low)	Dec 97 (High)
Injuries and Poisoning	**7,033**	**7,338**
Burns	140	149
Complications Of Surgical & Medical Care	330	337
Concussion	82	100
Contusion With Intact Skin Surface	1,120	1,160
Crushing Injury	34	25
Dislocation of Elbow	26	42
Dislocation Of Knee	34	32
Dislocation Of Shoulder	56	54
Effects Of Foreign Body Entering Through Orifice	266	269
Fracture Of Ankle	152	124
Fracture Of Clavicle Scapula	54	51
Fracture Of Femur	119	93
Fracture Of Foot	132	114
Fracture Of Hand	238	213
Fracture Of Humerus	73	76
Fracture Of Radius Ulna	195	227
Fracture Of Ribs Sternum Larynx Trachea	56	46
Fracture Of Skull	95	120
Fracture Of Tibia Fibula	58	68
Fracture Of Vertebral Column Without Spinal Cord Injury	48	48
Intracranial Hemorrhage	31	17
Intracranial Injury Unspecified	84	75
Open Wound Eye & Eyelid	41	28
Open Wound Of Head	568	633
Open Wound Of Lower Limb	122	144
Open Wound Of Upper Limb	623	780
Other & Unspecified Effectsx Of External Causes	86	101
Poisonings By Drugs	259	228
Sprains & Strains Of Joints & Adjacent Muscles	1,281	1,319
Superficial Injuries	228	286
Toxic Effects Of Non-Medicinal Substances	68	61
Traumatic Complications And Unspecified Injuries	185	149
Symptoms, Signs, and Ill-Defined Conditions	**3,057**	**3,351**
Diseases of the Respiratory System	**2,822**	**3,553**
Acute Bronchitis, Bronchiolitis	164	229
Acute Respiratory Infections	990	1,593
Asthma	506	631
Bronchitis, Not Specified As Acute Or Chronic	101	125
Chronic Bronchitis	70	63
COPD	111	88
Influenza	212	126

Other Diseases Of The Respiratory System	137	114
Other Diseases Of Upper Respiratory System	157	133
Pneumonia	374	455
Diseases of the Digestive System	**2,139**	**2,554**
Diseases Of Oral Cavity, Salivary Glands & Jaws	347	425
Other Diseases Of The Digestive System	1,792	2,129
Health Status Requiring Contact With Health Services	**1,716**	**2,500**
Diseases of The Nervous System & Sense Organs	**1,620**	**1,956**
Diseases of the Skin and Subcutaneous Tissue	**1,437**	**1,626**
Diseases of the Circulatory System	**1,190**	**1,270**
Cerebrovascular Disease	196	219
Diseases Of Arteries, Arterioles & Capillaries	43	52
Diseases Of Pulmonary Circulation	44	24
Diseases Of Veins, Lymphatics & Other Diseases Of Circulation	124	171
Hypertensive Disease	45	58
Ischemic Heart Disease	298	305
Other Forms Of Heart Disease	439	441
Diseases of the Musculoskeletal System and Connective Tissue	**1,048**	**1,110**
Mental Disorders	**1,004**	**999**
Diseases of the Genitourinary System	**891**	**974**
Diseases Of Female Genital Organs	282	251
Diseases Of Male Genital Organs	91	75
Diseases Of Urinary System	518	648
Infectious & Parasitic Diseases	**450**	**570**
Complications of Pregnancy, Childbirth, and the Puerperium	**396**	**372**
Direct Complications Of Pregnancy	269	238
Pregnancy With Abortive Outcome	127	134
Endocrine, Nutritional, Metabolic & Immunity Disorders	**348**	**401**
Diseases of the Blood and Blood-Forming Organs	**107**	**92**
Neoplasms	**87**	**100**
Conditions in the Perinatal Period	**28**	**24**
Grand Total	**25,397**	**28,818**

APPENDIX 1 - LIST OF HOLIDAYS

1997/98

Victoria Day – Monday May 19, 1997
Canada Day – Tuesday July 1, 1997
Heritage Day – Monday August 4, 1997
Labour Day – Monday September 1, 1997
Thanksgiving Day – Monday October 13, 1997
Remembrance Day – Tuesday November 11, 1997
Christmas Day – Thursday December 25, 1997
Boxing Day – Friday December 26, 1997
New Years Eve – Wednesday December 31, 1997
New Years Day – Thursday January 1, 1998
Family Day – Monday February 16, 1998

1998/99

Victoria Day – Monday May 18, 1998
Canada Day – Wednesday July 1, 1998
Heritage Day – Monday August 3, 1998
Labour Day – Monday September 7, 1998
Thanksgiving Day – Monday October 12, 1998
Remembrance Day – Wednesday November 11, 1998
Christmas Day – Friday December 25, 1998
Boxing Day – Saturday December 26, 1998
New Years Eve – Thursday December 31, 1998
New Years Day – Friday January 1, 1999
Family Day – Monday February 15, 1999

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Dr. Duncan Saunders worked as a physician and epidemiologist in South Africa before becoming an Epidemic Intelligence Service (EIS) Officer with the Centers for Disease Control and Prevention, US Public Health Service, Atlanta, Georgia assigned to the California Department of Health Services. He later served as Director, Non-Infectious Disease Epidemiology in the San Francisco Department of Public Health before coming to the University of Alberta in 1989. In California he was involved in the investigation of a number of disease outbreaks possibly related to environmental hazards; in the investigation of cancer cluster investigations; in injury surveillance and in a study of AIDs and cancer. Since coming to Alberta, he has continued to work in the fields of health services research and injury epidemiology. He was a principal investigator and co-author of major reports on redesigning local environmental health programs and on community-based health services delivery for Alberta Health and Health Canada respectively. Dr. Saunders has a particular interest in evidence-based decision-making in health care and teaches classes in evidence-based health care.

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